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OUTLINE
OF
INDUSTRIAL RELATIONS POLICIES
IN
DEFENSE INDUSTRIES

JUNE, 1940

INDUSTRIAL RELATIONS SECTION
Department of Economics and Social Institutions
PRINCETON UNIVERSITY
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I. INTRODUCTION

WAR abroad and defense at home have suddenly made "production" synonymous with "patriotism" in a large segment of American industry. The continued existence of the way of life which Americans like to call democracy will depend in large measure on the speed and effectiveness of our essential defense industries in attaining levels of mass production heretofore considered impossible. New concepts of organization, management techniques, standardization of products, streamlining of procurement, and expansion of labor forces will be necessary. While engineering and financial problems will be complex, in a country blessed with great resources of technical knowledge and funds for investment, these problems will be overshadowed in difficulty by those of developing overnight greatly expanded staffs of supervisors, technicians, foremen and employees capable of converting raw material and blueprints at top speed into tens of thousands of airplanes, tanks, guns and shells.

It is plain, therefore, that the capacity of America for sound and effective industrial relations is meeting its greatest test. In the twenties, industrial relations techniques were slowly maturing in the hot house of prosperity. The depression subjected these techniques to chilling blasts, and some failed to survive. Now, the demands of a democratic nation faced by the approaching danger of totalitarian war are calling for the utmost effectiveness in the cooperation of management and men in producing the sinews of defense for itself and other democratic nations.

Since September, 1939, the Industrial Relations Section at Princeton has been collecting material on industrial relations in a defense economy. In a bibliography first issued in December, 1939, and later in revised form in May, 1940, it listed the best sources of past experience and current developments abroad. But the collection and analysis of existing reports has seemed insufficient in assisting industrial executives faced with day to day problems in rapidly expanding operations. Therefore, this spring the Section began, on its own behalf, a survey of industrial relations policies and techniques in defense industries. With the invasion of the Low Countries on May 10th, the interest in the Section's survey grew overnight. Rather than awaiting further field work and analysis, it now seems best to make available to industrial executives, governmental officials, and labor representatives concerned in defense industries the material thus far obtained. In the following outline of problems, relevant items of experience are restated in the terms in which they have been obtained through interviews on the ground, from company memoranda, and through conferences with executives.

In its survey of the field, the Section has concentrated on three major groups of industries:

1. Aviation; parts, engines, planes and instruments.
2. Machine tools.
3. Basic, mass production industries, including steel, steel products, chemicals, electrical machinery, and transportation equipment.

While expansion to date has been most rapid in the first two categories, it was considered essential to canvass as thoroughly as time permitted the *plans* and *problems* of expansion in the third category of older or more highly integrated companies. It was found that these latter companies were in a much better position to absorb rapidly mounting orders, but that estimates as to the total capacity to be anticipated were being rapidly increased. Some of the best planning had already been done by these companies and, in a sense, they have been used in this survey as a control group. It is a serious question, however, whether even these companies have been able to prepare sufficiently for the levels of production which our defense program will entail.

In the machine tool and aviation industries, defense orders are reaching plants already taxed to capacity. Problems of expansion of facilities and staff have already been attacked again and again as sights have had to be raised. Job-shop methods have had to give way to varying degrees of mass production organization, with a vastly accelerated tempo of change ahead. The youth of the aviation industry has been in some ways its greatest asset. New designs, new plants, and new production methods have kept the industry alive and adaptable to change. The machine tool industry, while outstanding in its refinement of engineering design, embodies the conservatism of an older generation which has gone through feast and famine before and faces new concepts of production with a grim and cautious realization of the "morning after."

While time does not permit any thorough analysis of the Section's findings to date, one fact is increasingly evident. In moving into large volume production, defense industries will find no ready-trained group of supervisors, technicians, and skilled labor at hand. Rather than obtaining personnel to fill in an existing pattern of plant organization and lay-out, organization and processes will have to be adapted to the personnel available. But meanwhile, the volume of production necessary is making mass production possible. Instead of one man completing ten steps in fabricating a product, ten men will need be put to work on one step. This change involves mental and physical adjustments of heroic proportions. But such adjustments are already being made. Once consummated, the possibilities of intensive training of thousands of new employees on single steps in production open up vast supplies of usable labor. With this change in many industries, the bottleneck becomes not skilled labor, but the availability of competent supervisory and technical personnel at all levels.

Among the industries studied, the machine tool industry apparently offers the greatest obstacles to a shift from job-shop to any large degree of mass production organization. In its own protection, the industry has maintained a considerable degree of diversification. Orders for particular products have usually been small. The niceties of machine-tool fabrication have required the use of many highly skilled mechanics who, like custom tailors, possessed a "feel" for the finished product as a whole. To raise production to the levels now necessary, much less skilled labor will need be absorbed. The adjustment of shop lay-out and operations to make the most of such labor will require the highest degree of ingenuity and vision. At the same time the industry will face, along with other defense industries, the accumulation of industrial relations problems which comes with rapid expansion of forces. In many ways, the attainment of large-scale production in the machine tool industry will be the test of American engineering and American industrial relations in the face of a national emergency.

It is still too early to find much experience in the expansion of executive organization in defense industries. There are indications, however, that executive staffs in many companies will need additional personnel. Where promotion from within is possible, many problems will be obviated. But smaller companies without the advantage of adequate executive material may face the task of absorbing "outsiders" into the official family. In either case, past experience demonstrates the value of "organizational preparedness" in the careful allocation of functions, in the refinement of policy-making techniques, in effective administrative controls, and in adequate liaison at all levels. Those companies which enter upon defense production with a soundly planned and thoroughly trained executive organization have probably the greatest single asset in meeting the strains of rapid expansion.

Some companies have already faced the problem of replacing executives and other employees who have been called to government positions or may be mustered into military service. The parallel growth of defense industries and defense forces will add to the difficulty of assuring adequate personnel. Currently expanding industries appear to be relying heavily on young men of military age for tasks in which intensive training is necessary. The possibility of heavy demands by the government for trained men to operate and service aviation, motorized and other mechanical equipment cannot be overlooked in planning the expansion of defense industries.

Many industrial relations policies and techniques that have evolved over the years take an added importance in industry's adjustment to rapid expansion. The development of effective, harmonious labor relations is vital in defense production. Collective bargaining procedures, including mediation or arbitration where necessary, will need be smoothed and stream-lined to avoid any danger of interruptions. Grievances, instead of being allowed to accumulate under the surface, with adverse effects on morale and efficiency, will need to be cleared justly and quickly through established, functioning machinery. Where such machinery does not already exist, experience shows that its early development is of fundamental importance. In all matters of joint concern, the active participation of both labor and management in determining policy is from all evidence imperative to the highest level of efficiency.

The problem of seniority protection has already taken on added significance. Skilled workers in non-essential industries will frequently face the loss of valuable rights in moving to defense industries. Protection of these workers by furlough privileges will release many otherwise willing employees and reduce turnover in the companies in which their services are for the time most valuable to the nation. Such furloughs with preservation of seniority rights are already contemplated in many instances in regard to absence for military service. It now appears in the public interest to encourage their use where employees can be spared for defense production.

Other problems of an increasingly acute importance include:

The development of continuous and effective wage and salary administration.

The maintenance of ratings upon which to base promotions in expanding forces.

Supervisory training in industrial relations techniques.

Expanded health services for executives, supervisors, and employees.

Re-study of work schedules and strains to obviate fatigue.

Examination of the special problems in the employment of women.

In more isolated locations, the planning of adequate housing and transportation facilities.

These and many other problems will tax the wisdom of industrial executives, labor representatives, and government officials. Much experience is available. More is now accumulating and should be cleared as rapidly as possible among responsible persons.

The following outline and statements of experience are but a rapid sketch of the problems which lie ahead. That these problems will be solved successfully in the vast majority of American companies can be unquestionably assumed. The most important ingredient in their solution will be the determination of the American people, employers, and workers alike, to let no obstacle stand in the way of building at top speed an impregnable defense against aggression in a world torn by war.

II. EXPANSION OF MANAGEMENT ORGANIZATION

A. EXECUTIVE ORGANIZATION (PLANS, FUNCTIONS, PERSONNEL)

EXPERIENCE now accumulating indicates that expanded production calls for careful planning of recruitment and training of personnel, rearrangement or enlargement of plants, purchasing of additional equipment, and in some cases the inauguration of new production methods. At the same time problems of coordination and administration of policies are becoming more pressing because of the employment of new production workers and the advancement of regular employees into the ranks of supervision.

Technical and clerical staffs have already been increased in many companies that are facing rapid expansion. In some, men with executive ability have been made assistant managers. In other cases, it has been necessary to transfer executive personnel from their regular tasks to assume key positions in new or reconditioned plants that are faced with rush orders. It appears that qualified executive personnel is scarce in some companies. As a consequence of the forced "dilution" of the top management organization, each executive is called upon to assume an increasingly heavy burden of responsibility both in planning of expansion and coordination of production.

*Experience Reported**

> Qualified members of the Manufacturing Organization analyzed the blueprints of parts we were to make, to determine the types of machine tools necessary and the number of productive-hours' capacity required of each type. This was done by tabulation. This informed us as to the number of machines we would need operating 24 hours and the number of men we would need to operate the machines.
>
> It then became the function of the Planning Department to make arrangements for locating the new equipment and rearranging old equipment for manufacturing economy; the Purchasing Department to obtain the best delivery on the machine order; the Tool Design Depart-

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*In the selection of items of experience in various companies under each section of the Outline, consideration has been given to both the predominance of certain methods and the range of variation.

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ment to proceed with designs of necessary tools and fixtures for the new equipment; the Maintenance Department to locate the equipment as soon as it was received; the Production Department to plan machine loading; and the Personnel Division to obtain the necessary operating man power.

These activities threw a terrific burden on the shoulders of officials and operating chiefs. The burden was especially heavy because during the last ten years overhead had been kept to a minimum. Although some new people were hired, none were for the so-called key positions. Not enough time was available to train men of the so-called executive type in our way of doing business and in the personality of the organization. Some advancements were made from within the company and these vacancies filled by other advancements, or from new employees from the outside.

There has been no expansion of executive personnel. Each executive, however, has been given additional clerical and technical help. It is almost impossible to hire superintendents from the outside who have a working knowledge of aircraft manufacture. Consequently, most of the superintendents have been developed from within the organization. Their effectiveness has been increased by building up supervision underneath them.

The present executive staff is adequate for a substantial expansion in production. In two divisions an extra assistant manager has been appointed. Another executive is devoting full time to following through government orders. Aside from these three additions no further expansion of executive personnel is contemplated.

When a new plant was opened recently, executive and supervisory personnel were transferred from other plants which were not operating at full capacity.

B. TECHNICIANS AND ENGINEERS

Although universities and colleges seem to be graduating a plentiful supply of engineers and technicians, there is, apparently, a serious shortage of trained technical personnel with sufficient experience to hold key positions in rapidly expanding industries. Skilled draftsmen are required in increasing numbers to make drawings, not only for new products, but also for the lay-out of new plants and equipment. The demand for experienced test engineers in the aviation industry is apparently far in excess of the immediate supply. In this regard, there has been an effort to secure engineers who have had some experience in the automotive industry. Yet, for the most part, the new expanding industries are becoming increasingly dependent on developing technical personnel within their own organizations. Because of the immediate pressing need for engineers, training programs in some companies have been shortened and intensified. There has been an apparent swing away from more formalized procedures to flexible training programs designed to develop each individual as rapidly as he is able to assume responsibility.

Experience Reported

From the standpoint of management organization, there is a serious shortage of competent technical engineers. It takes about 2½ years to develop a college technical graduate into a responsible test engineer. If men are recruited from the automotive industry, the average time may be cut to one year.

The company has never had a "cadet engineering" program, but has had a general program of training college graduate engineers. This year the company has taken on about three times as many graduate engineers as formerly. The expansion in this program is based on the prospective requirements for the next five-year period.

The training program for college graduate engineers is undergoing considerable change. No matter what formal procedure is developed, it will be necessary to shorten the most desirable training period. For example, a good test engineer should have at least 18 months' experience as a motor tester. Already it has been necessary to put men in such positions with only 10 months' experience. Efficiency is in some cases sacrificed on this score. Furthermore, more supervision is required.

The training program at the present time is aimed primarily at the development of project engineers in design, project engineers in research, service engineers, field engineers, and sales engineers. A rather definitely formulated program is adhered to as closely as possible, but the speed of advancement depends entirely on the individual and his capacity for promotion. Thus some men may become qualified engineers in a year's time, while others may take three years. Technical graduates are used on experimental testing work as a means of training.

It is recognized that the training of engineers can be speeded up by formal class work. This will include discussions of company policies, experimental engineering, testing, organization and problems of production units, etc. The students will also do "laboratory" work in actually taking down and reassembling motors, etc.

Less attention is being given to the development of production or industrial engineers. Management feels, however, that there is a definite shortage of technically trained men in this field. It is felt that more foremen and assistant foremen should have technical training.

There is a shortage of technical personnel, but an effort is being made to meet the need by hiring young engineers who have had some automotive experience. A test engineer with the necessary technical qualifications can be trained to specific company requirements in from six months to a year's time. If aircraft designs become more standardized, fewer test engineers will be necessary for design and research. The actual testing of completed motors can be performed by a skilled mechanic as well as by an engineer in training.

Technical personnel is organized in groups or units. One man, the group leader, is a seasoned and experienced engineer. The others comprise men of a few months' experience as well as completely green men. As fast as each individual develops, he is given more responsibility, until finally he becomes qualified to be a group leader or is put on a special assignment. This group organization of technical personnel parallels the organization of production workers under group leaders. All training is exclusively on the job.

Another difficulty experienced is that other companies tend to "steal" trained engineers. This problem is not so serious in a company where the technical staff is very large. In the smaller concerns, however, the loss of two or three trained engineers may have serious consequences.

It is becoming increasingly difficult to secure skilled draftsmen. To date the company has had to go far afield to secure qualified men. The company has even thought of hiring engineering students with some sort of understanding that they will be advanced as more desirable jobs open up. Even so, it is estimated that it takes almost six months to train such students in the type of work required.

The increased demand for draftsmen will come from two sources. First, the drafting of drawings for additional production and new products. Second, the lay-out of new plants or equipment.

C. SELECTION AND TRAINING OF SUPERVISORY PERSONNEL

In terms of numbers, the greatest required expansion of management organization is in the lower level of supervision. In aircraft, for example, a skilled group leader is needed for every fifteen to twenty workers. In order to supervise the group leaders, additional sub-foremen are required. As the base of the pyramid of management organization is broadened, the supervisory responsibilities of department foremen and superintendents are thereby multiplied. Furthermore, in many companies foremen have been accorded more responsibility for selection and training of sub-foremen and group leaders. Foreman training programs have been intensified in some companies. Some executives pointed out that management looked upon foremen as the most capable men in the organization, and counted on them to train and educate their subordinates. In other words, in an emergency, emphasis may shift from the training of foremen to the training of group leaders and key production workers by the foreman.

Experience Reported

> In building up our supervisory organization without exception we advanced the best mechanically qualified men who showed some evidence of having the proper personality for supervisory work. With more time we probably could have made better appointments. There is such a shortage of potential supervisory material that some foremen and assistant foremen are supervising considerably more territory than efficient operation would indicate as good practice. We did not attempt to hire supervisors from the outside.

> Due to restricted business for the past several years, we have a surplus of men whom we can replace as supervisors, as in our organization some of our former supervisors have been reduced from their ranks. These men, with very little training, can assume their former positions.

> We are well prepared to recruit and train additional foremen if needed. The company has had a definite training program for many years. The present intensive training program, which was instituted three years ago, has created a reserve of available supervisory personnel. The present staff of foremen could be augmented by promoting assistant foremen and group leaders, most of whom have had some training already.

> As production is expanded, operations are divided up. The skilled worker who could perform all the operations when production was on a small scale becomes a group leader in charge of about twenty men who perform the component operations. There is a serious shortage of qualified group leaders, and in some cases men have been selected who were unfit to act in this new capacity. The major responsibility for selection of group leaders is put on the foreman, for he is the only person in close enough contact with the working force to judge their qualifications.

> There has been some difficulty in securing "set-up" men and subforemen. However, during the past few years the company has attracted workers laid off from supervisory jobs in other companies, and

a number of these have had supervisory experience and can be promoted to supervisory jobs as operations expand. Short, intensive training is given to all new supervisors.

Since 1926 the company has had a foreman training program. Any worker in the plant may enroll in the training courses provided that he is "selected" by management as potential material for supervision. In practice, nearly all the promotions into the ranks of the supervisory forces are made from those workers who have attended the foreman training courses consistently.

A great number of plant workers have attended these courses. Thus, there has been a reservoir of partially trained workers who can step up into supervisory positions without much trouble. This program has alleviated, though not eliminated, the problem of securing group leaders and assistant foremen during the rapid expansion period.

The foreman training course is a continuous program that goes on from year to year. In effect, the program has expanded into a course of industrial management. The subject matter is changed from time to time to keep up with changing trends. Many foremen have attended these courses consistently since their inception in 1926.

Because of the pressure of production duties, time has not been psychologically right for starting a supervisory training program on a formal basis. Such a program, however, is highly necessary and will be started very shortly. The training will treat principally with job duties, authorities and responsibilities, and labor relations.

The supervisory organization was expanded so rapidly that we were unable to train new supervisors in the matters of company policies and what was expected of them in their new jobs. As a result, many of the supervisors "floated" in their new capacities until experience sharpened them up. We noted in some cases that some supervisors had trouble relinquishing the idea that they were no longer members of the working force and had difficulty making the mental transition from that of a worker to a member of management. Another troublesome point was the reluctance of old foremen to relinquish part of their authority and make full use of the supervisors assigned to aid them.

In discussing what we have done here in training new employees and fitting them into our manufacturing departments, it is only fitting that I should say in the beginning that this work has largely been accomplished by our foremen. However, this has been possible only because the company has given the foremen the necessary assistance in the form of preliminary training in a vestibule school, good related subject instruction, and relief from production pressure through the appointment of assistant foremen and group leaders. Everybody seems to want to educate the foremen, but we have taken the view that our foremen are just about the best educated and most capable men in the organization, and we have tried to give them an opportunity to educate the others. We have held weekly Foremen's Meetings, but these have been to enable discussion and clearance of interdepartmental problems, and not for training.

There has been considerable difficulty in persuading skilled production workers to accept promotion into the ranks of the supervisory force.

III. RECRUITMENT OF PRODUCTION WORKERS

IN spite of the large volume of unemployment today, machine tool and aircraft industries report a serious shortage of qualified skilled labor, particularly tool and die makers. Although there are thousands of unemployed workers who are classified as skilled labor, company executives have indicated that a very small proportion of those applying for skilled work possess the experience and qualifications required in those industries which have already had sharp expansion of production. Another difficulty is that the demand for skilled workers has been concentrated to date in specific areas rather than evenly distributed throughout the country. Thus the shortage is much more serious in some communities than in others.

In some cases, skilled workers have been laid off by companies that have reduced forces. Such workers, however, are not anxious to jeopardize their seniority standing with their regular employers by accepting permanent employment in such lines as the machine tool, aircraft, or shipbuilding industries. A company expanding its operations in response to defense requirements may be forced to hire certain skilled workers with the knowledge that they will return to their original employment when needed. If related industries are called upon to expand operations in the near future, the skilled labor shortage will become increasingly serious.

The problem of securing semi-skilled help and workers who can be trained quickly for single operations was of less concern to the employers interviewed. In some communities, however, nearly all available graduates of vocational and trade schools have been absorbed. Selection from among general applicants favors those with some technical training or previous mechanical experience. Women have not yet been hired extensively for unskilled work as they were in 1918, because the supply of male unskilled labor is more than sufficient to meet the demand.

Because of the shortage of skilled workers relative to semi-skilled, some of the companies studied are being forced to develop, as best they can, skilled personnel by intensive training of helpers and other semi-skilled workers who show capacity for promotion. In any case, some executives have pointed out that efficiency is bound to be impaired as a result of the skilled labor shortage.

Experience Reported

A. SKILLED AND SEMI-SKILLED WORKERS

To accelerate the process of getting into production quickly, two steps were taken. Skilled operators from our commercial department were advanced into the new aircraft division on the same type of machines they were accustomed to operating. In many instances skilled operators who had demonstrated qualities of leadership were made set-up men, assisting employees who were being trained, adjusting the machines, grinding tools, keeping the work moving, etc. The advancement of men from the commercial department posed a problem which is very difficult to evaluate. While this move aided us in getting the aircraft departments under operation, it also doubled the breaking-in problem as new men had to be trained for the jobs left vacant. It might be argued that it is cheaper to train new men for the jobs open rather than follow the advancement policy. This might affect employee morale, however. Other advancements were made on the basis of personnel inventory forms in which employees informed the management of the type of work they are most interested in performing.

We were unable to hire skilled men, such as tool makers, grinders, automatic set-up men, and screw machine hands with any degree of success. Advertising in local newspapers failed to produce the proper answers. Visits to neighboring towns where other factories were not busy were not productive of men in any quantity. The State-City Employment Bureau made a canvass of the situation and reported that no skilled men were available. A few skilled men were obtained from other local companies who happened to be laying men off at this particular moment.

Employment Exchanges and Agencies were very helpful in providing us with tool designers, draftsmen, and such types of skilled technical help. However, in this area such agencies cannot be depended upon to provide skilled shop help.

It is almost impossible to recruit all-around skilled machinists and mechanics. In one day about 200 persons applied for employment stating that they were skilled help. Of these only 10 could be employed, and these 10 were not very well qualified.

The proportion of highly skilled workers in the machine tool industry is very high. Nearly 60% of this plant's working force are skilled workers, whom it would be exceedingly difficult to replace and whom it is almost impossible to employ at the present time.

In the airplane manufacturing industry a large portion of the working force must consist of skilled craftsmen. The semi-skilled workers, furthermore, must have a great deal of manual dexterity. Skilled and semi-skilled help is difficult to locate because there is no other industry that is closely allied to aircraft manufacture. There is a serious problem in securing and training men who have sufficient manual dexterity for precision work.

* * *

This company is just developing its plant for production of a new type of plane.

The great majority of the sub-foremen who will be required when production gets under way are now employed in getting machinery set up. Some of those now working, however, will continue as skilled production workers. The additional forces of semi-skilled and skilled workers will have to be secured from the outside.

The possible sources are as follows:

1. Graduates of vocational schools. The supply of these is already almost exhausted. It is possible, however, that night training schools (both private and public) may be able to supply good material for the semi-skilled, one-operation jobs. The company cannot train such workers, however, until the actual jobs are in existence, for the short-period intensive training can be carried out only on the job.

2. Personnel from industries closely related to aircraft. The supply of such workers in the local community is practically exhausted.

3. From miscellaneous employment applications. Although there are thousands of persons who apply for jobs, very few have the requisite skill and training.

Thus it is contemplated that the bulk of the semi-skilled force will be recruited from vocational, and short-period training, aeronautical, and technical high schools. It is expected that the age of this group will be well under 25.

Because of the prevalence of seniority rules in local manufacturing plants, it is very hard to attract skilled workers away from their present jobs. Those that are on furlough at the present may accept temporary employment in an aircraft company, but they usually prefer to return to regular jobs when called. Thus an aircraft company may be able to secure some help on a temporary basis, only to lose such help as business in other industries increases.

* * *

Of the factory workers employed since November, 1939, about 25% have been skilled workers, 45% semi-skilled, and the remainder, learners or unskilled workers. The policy of the company has been to employ all the skilled labor that is available, but it has not gone far afield to secure such labor or to steal it from other concerns. The main concern of the company is to develop its own semi-skilled and skilled personnel within the organization.

The company has not found employment exchanges of much use in procuring skilled labor. Because of location in a large metropolitan area, the problem of supply of unskilled and semi-skilled labor has not been acute.

Due to the number of old and experienced men in our employ we could take on considerable additional work. Also, as we have a number of old employees laid off, some of whom are now working on W.P.A. and other types of work, we are quite certain that we can have these men return to our plant.

We have a number of men now doing minor machine and assembly operations who could be advanced into more highly skilled positions.

Occasionally technical school graduates have been the source of supply for our company. There is no doubt that some of these graduates, who are working now in other occupations, would be pleased to come into our industry.

We use our own Employment Department, the State-City Employment Office, and private agencies, if necessary.

As yet there has been no serious shortage of skilled workers. The only danger of bottlenecks in this regard would be the stealing of skilled workers by other concerns.

Any attempt to divide workers into categories such as skilled, semiskilled, and unskilled, is unsound. The variations in degree of skill are almost as numerous as there are workers themselves. Physique, temperament, prejudices and other factors are almost as effective as training in many cases in determining that work which a man can and will do well. Frequently we find men who can do one or two extremely delicate operations better than any tool maker or thoroughly trained mechanic of fifteen or twenty years' experience, although the ability of these men to transfer from one difficult operation to another is strictly limited. Due to the nature of this company's business (relatively small runs on complicated parts requiring extreme accuracy), we have placed a higher premium on all-around thorough training and ability to transfer from one difficult operation to another than on specialization in some particular operation requiring great skill.

The company has been able to pick up many skilled workers who had been employed in shell factories in the last war. No shortage so far.

The supply of skilled labor in the state is already exhausted, and employment offices have not been much of a help in filling the skilled-labor jobs.

The ——— State Employment Service has mobilized its best interviewers to procure skilled help for the metal trades.

Our company would employ 200 tool and die makers tomorrow if it were possible to get them. We have been forced to sub-contract a great deal of our tool and die work.

The available supply of shipfitters is already exhausted. A serious shortage of machinists is imminent, and there will soon be shortages of shipwrights and boatbuilders. The shop superintendent feels that it will be necessary to relax the qualifications for these jobs. In short, to meet the expansion program for defense purposes, it may be necessary to hire men who are only 50% efficient. In other words, two semi-skilled men will have to work on jobs that have been customarily handled by one skilled worker.

". . . In order of their importance, the four major points for which we look in an applicant are: First, a well-balanced temperament; second, aptitude for a particular job; third, special knowledge or skill; and fourth, intelligence. . . .

"In selecting the skilled worker, however, the applicant's aptitude is of no particular concern. It makes little difference to the employer whether the new employee had previously spent three months or ten years learning his trade. The question is, can he demonstrate the required knowledge and skill, or is he a 'trade bluffer'? . . . hence the importance of trade tests. . . .

"For certain types of applicants we use mechanical aptitude tests to determine the degree of manual dexterity on the part of the individual. This is particularly important in our learner classification, as nearly all of the studies of mechanical aptness point to two predominant prerequisites:

"1. That the individual have a high degree of coordination between hand and eye;

"2. That there be also a superior sense of spatial relationships.

"We have found that the individual so endowed can be trained quickly and easily for successful production, especially in the repetitive operations. . . ."

—Excerpts from "Turning the X-Ray on the Hiring Line."
Aviation Magazine, January, 1940.

> "More recently two manufacturers in the same community worked out a cooperative plan which contains a suggestion of how the disruption caused by labor competition in an emergency may be reduced. One of the companies—an aircraft manufacturer—was confronted with a need for trained men so as to fill a record backlog of orders. The other company, which manufactured typewriters, suffered from curtailment of its export business. The aircraft company submitted a schedule of the various types of mechanics wanted and the typewriter company studied its rolls to learn those qualified. Surplus employees were 'loaned' to the aircraft company without considering the transfer a break in their continuous service records."
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> —*Intensive Training of Industrial Employees.* Policyholders Service Bureau, Metropolitan Life Insurance Company. New York. p. 6.

B. EMPLOYMENT OF WOMEN

> Certain simple routine operations, especially those involving small parts and requiring finger dexterity, were selected, and women employed to do them. In every case the employees previously performing this simple routine work were promoted to better jobs, and we found that in most cases very little training was necessary to enable inexperienced girls to do even better work than had previously been done by men and boys. The number of jobs which we have been able to have performed by this group of unskilled repetitive workers has constantly expanded and has in many cases released relatively skilled workers for more important work.

> The employment of women on production jobs has not been wholly satisfactory. They do not have judgment as to tolerances. It is a question whether to use men entirely for these jobs or to provide more supervision for women.

Few of the companies interviewed reported any considerable increase in the percentage of women employed. The following excerpts of reports of the employment of women in industry during the World War show how extensive the replacement of men by women can be when conditions require it.

The principal facts disclosed by a survey made by the Women's Bureau were:

> "First. The popular belief that women in industry rendered real service to the Nation during the war is sustained by the figures showing the numbers of women employed . . . by the preponderance of

evidence from employers holding important Government contracts, and by the official statement of the Assistant Secretary of War. . . .

"Second. The labor shortage and excessive demands on industries essential to the production of implements and agents of warfare resulted during the war in—

"(a) A sharp increase in the number of woman workers in these industries during the war.

"(b) A marked decrease in the number of women in the traditional woman-employing industries. . . .

"(c) The employment of woman labor in other skilled crafts from which women had been practically debarred before the war.

"Third. When the managers of private, Government, and Government-controlled plants were confronted with the necessity of employing women in skill-exacting positions there were practically no trained women available, because—

"(a) Public and private vocational institutions had given little encouragement to the training of women in mechanical occupations.

"(b) Organized labor policies . . . discouraged apprentice work for women in skilled occupations.

"Fourth. The training of women employed in skilled occupations during the war was provided principally by the employing firms. . . ."

—*The new position of women in American industry.* U.S. Department of Labor, Women's Bureau, Bulletin No. 12. 1920. pp. 34-35.

". . . The amount and character of replacement was dictated not only by the pressure of war contracts but also by local plant and labor conditions. Different sections of the State show interesting variations. According to the natural progress of replacement women filled first those vacancies where the work was light, less skilled and repetitive, on such metal cutting machines for instance as lathes, stamping machines and gear shapers. Heavy or skilled work was attempted only after considerable time had elapsed, or in response to unusual conditions such as existed in Western New York. . . .

"As any list of processes on which women have replaced men will show, there are few types of work on which women have not been tried with more or less success. . . .

"Women have replaced men:

"(1) where the material to be handled was not too heavy or could be lifted by a boy or man serving several workers.

"(2) where the machine could be operated without physical strain.

"(3) where the machine could be reset and cleaned or process readjusted by a woman or by a man serving several women.

"(4) where training could be reduced to a minimum by the production of a standardized product or the sub-division of a process. . . ."

—New York Department of Labor, Special Bulletin No. 93. *The industrial replacement of men by women.* March, 1919. pp. 6 and 8-9.

IV. TRAINING OF SKILLED AND SEMI-SKILLED WORKERS

A. APPRENTICES

DURING depression years, many companies suspended apprentice training programs. Consequently, there is now a shortage of apprentice graduates. Only a few of the companies faced with a sudden increase in operations are expanding their apprentice groups. In many cases it has been more practical to transfer apprentices with one or two years' training to regular production jobs. Most company executives interviewed looked upon apprentice training more as a long-range program for developing potential supervisory material than as a means of training skilled productive labor needed in the immediate future. In the development of skilled and semi-skilled labor, more emphasis has been placed on short-period intensive training for specific jobs or operations.

Experience Reported

For several years, we have had a formal four-year indentured apprenticeship program in effect. The apprentices were immediately placed on vital work such as making tools and fixtures and the making of sample or experimental parts. Four were made supervisors.

We started an apprenticeship school about three years ago and are delighted that we shall soon begin to receive graduates into our various departments. The apprenticeship school has included:

1. Related instruction at technical schools.
2. A vestibule school under an Apprentice Supervisor, assisted by three skilled workmen, in which apprentices learned the fundamental principles and operating technique of each machine tool before going into the department where that machine tool was to be used.
3. A definite system of follow-up by the Apprentice Supervisor to see that during the three to six months in which the apprentice worked in a department he was given jobs which were progressively more difficult and which taught him the fine points of the work done in that department.

4. A definite schedule providing for thorough training in all important divisions of work within the four-year period covered by the apprenticeship course.

5. A written Apprenticeship Agreement which required a definite educational background and mechanical aptitude, consent of parents, and quarterly reports to parents on progress accomplished.

Apprentice training of three years is looked upon as a long-range program. Irrespective of contraction or expansion of the general working force, 50 apprentices are taken on each year. The very highest types of boys are selected for this course. In fact, the purpose of the program is to build up a reservoir of potential supervisory material rather than to train production mechanics. All the boys must have high school educations with average grades of 85 or better. They must have had training either in technical high schools or vocational schools. During their apprenticeship course they are required to continue high school work and in many cases to take courses at a local university. The apprentice group is looked on as the "cream of the crop."

The company has an extensive apprentice training program which has been operative for several years with the exception of two years in the depression. This training should be augmented in spite of the fact that the present program is designed to provide necessary skilled personnel for the next fifteen years.

The company has always had a regular apprentice course. This has been expanded recently, but does not turn out skilled workers in sufficient number to meet the present need.

In regard to the supply of trained skilled workers, this organization is in a favorable position. A comprehensive apprentice training program was started in 1930 at the time when industrial companies were discontinuing apprenticeship programs. Consequently, a considerable number of apprentices have been trained during the past ten years who are holding key positions today.

In times of rapid expansion it has been practical to put apprentices with two or more years' training on regular jobs. In nearly every case they are superior to helpers who may have been given a short intensive training course.

The apprentice group is looked upon as the most fruitful source of new supervisory personnel.

A program of training machine operators and apprentices has been in existence for several years under a special supervisor of training.

> Before November 1939, it had been the practice of the company to train apprentices and skilled employees who might be qualified for almost any job in a particular department. Both these programs by now have been more or less shelved because of the pressing need for workers who can be trained more quickly to operate a single machine.

B. SHORT-PERIOD, INTENSIVE TRAINING IN THE PLANT

As production expands, it is often possible to break down skilled operations through the division of labor. In a relatively short period, new or unskilled workers with the proper mechanical aptitude can be trained to perform one or two operations normally part of a skilled job. By intensive training on the job, supplemented in some cases by limited classroom instruction, unskilled workers may become qualified to perform particular types of work on a single machine. Such short-period intensive training programs are not usually introduced until after the jobs have been broken down. A definite knowledge of anticipated production schedules and the types of operations to be performed is usually prerequisite to any program of specific job training of this kind.

An emergency training program has two objectives. The first is to qualify new or unskilled employees for specific semi-skilled jobs; the second is to continue the training of promising semi-skilled workers or learners to enable them to qualify for more skilled and more responsible jobs such as set-up men or group leaders. In both cases individual workers are trained step by step as they demonstrate ability. In many companies, training of this nature is a responsibility of the foreman, but the expense involved is charged to a separate training account rather than directly to the department. Some companies have their own "vestibule" training schools; others rely mainly on local educational institutions.

Experience Reported

> A trade training department was established consisting of a superintendent of training and three instructors. Graduates of technical high schools or other young men between the ages of 19 and 30 with previous machine experience were entered in what we termed a learner training program. This was designed to train grinders, automatic screw machine set-up men, and hand screw machine operators. The learners received two classroom instruction periods of two hours each during the week and actual training on the machines under the supervision of an instructor and an operator for 38 hours of the week. After three months the learners were considered journeymen and advanced to the going rate of the job.

In the main, the problem of skilled help is being met by training young graduates of vocational schools to become operators of a single machine within about six or seven weeks. The procedure is to put the trainees on a machine along with the instructor, who is the regular machine operator. As soon as the trainee becomes proficient, the instructor is moved to another machine. The former trainee now becomes an instructor and is used to train new employees. It has been found that this procedure of short-period intensive training on a single machine is being expanded rapidly enough to take care of increased production requirements. In fact, the training of personnel has been slightly ahead of expansion in production, due to the considerable delay in securing and setting up the necessary machine tools.

It was pointed out that as production expands further the need for all-around skilled workers will become proportionately less. In other words, it becomes more practical to use men trained on one-machine operations. At the outset of the expansion it was contemplated that the working force should consist of 10% highly skilled workers, 30% semi-skilled, and 60% unskilled. In actual practice it has been found that the proportion of skilled workers necessary was estimated slightly higher than necessary.

As a consequence of the short intensive training program which apparently can be expanded quite easily, company officials claim that they are not faced with any serious bottlenecks in the field of semi-skilled workers.

As production expands, operations can be progressively broken down, and thus required skill is less exacting. To develop personnel for single operations a short-period intensive training program has been adopted.

In the past, the most usual method was to hire unskilled workers and put them to work under the group leader. At first such a worker might chase tools and do other odds and ends. Gradually, he would learn to do a particular type of work, and if he showed considerable qualification, would advance into higher skilled work. This procedure called for the determination of potential skill on the job. At the present time a large proportion of the semi-skilled labor force is recruited in this fashion.

Last fall a training school was set up. Its function is two-fold: (1) to test manual and technical aptitude; (2) to offer preliminary elementary instruction. The school is run by the company. The period of training in the school averages about four weeks, but varies between individuals. Some take six weeks, some may be put to work in the plant after two weeks. Nearly all of the training is for specific jobs for which the plant needs more hands. While the boys are in school the company is given a chance to observe them in action and thus to determine their potential qualifications. Each boy is trained separately in most instances. As soon as the individual is sufficiently developed, he is given a job and regular assignment in the plant. Trainees are not paid by the company while they are in the school.

The trainees for the school are selected in practically the same manner as new employees. They go through the same interviews, physical examinations, etc., as if they were being employed. Most of the trainees are high school graduates who have shown aptitude in mathematics or mechanical drawing. Some have had manual training of one sort or another. Because of the tremendous number of applications the company has been able to select boys of fairly high quality.

If a boy has graduated from a vocational school he is usually put into the plant directly, and does not enter the company training school described above.

We have very carefully selected workers with outstanding skill and promoted them to Assistant Foremen, Gang Leaders and Set-up Men. The positions left vacant by these men were filled by carefully selecting the best men from the remaining group and the grading was carried all the way down the line to the lowest grade of worker. In this way, the last line positions became vacant and were filled with new employees requiring training. While the foreman was primarily responsible for this training, he was permitted to assign skilled workers to assist him with a new employee if he considered this necessary, and the time of this skilled assistant was charged against a training account. Practically every employee was given an opportunity to advance either in responsibility or wages, and a real spirit of cooperation was exhibited in the numerous ways employees can help one another. This cooperation is hard to explain but is one of the most essential factors in securing satisfactory training results.

Like the aircraft industry this company has been forced to use rapid training methods to qualify learners to operate a single machine. All training of this type is done on the job. Learners can be trained to perform some of the simple operations in making parts. The use of learners, however, is very inefficient, and the company follows this procedure only because it is forced to do so.

The foreman is permitted to put on learners without having the expense of training charged against his department.

"Principles of Short-Period Training: The following principles of short-period training, drawn from the methods of the War Department's Committee on Education and Special Training [1918] are those upon which industry's leaders may be forced to build their skill-training programs in the near future:

Define and keep up-to-date the specific requirements of all jobs to be filled
Train in a staff school
Provide instructors with uniform written descriptions of procedure
Reduce classroom work to a minimum; train on the job
Train the man well in part of a trade
Base the individual's training schedule on his experience
Break the skill to be learned into a series of jobs of increasing difficulty
Give the trainee clear, concise descriptions of each job and check his understanding of the work by questions."

—*The Conference Board Management Record.* September 1939. pp. 139-142.

"Normally production workers are trained on the job. With the training of large numbers of new employees, however, a special part of the shop is often set aside for training purposes. The learners are engaged on regular production but the first consideration of the instructor is to develop competence rather than speed. Just where employees are trained depends not only upon the number learning at one time but also upon whether training will upset the production processes, whether machines and facilities can be set aside for training purposes, whether employees can be trained on production, whether shop conditions are too distracting for satisfactory instruction, and similar considerations."

—*Intensive Training of Industrial Employees.* Policyholders Service Bureau. Metropolitan Life Insurance Company. New York. p. 14.

C. VOCATIONAL AND TECHNICAL SCHOOLS

From the standpoint of defense industries, the training given in trade and vocational schools is important. Many aircraft companies now give preference in hiring to young persons who have completed the full-time day courses in vocational schools. There is an increasing need for the expansion of evening training courses to equip adult employed workers for promotion to higher positions. Finally, some vocational schools, which have the proper equipment, have recently set up short, intensive-training courses for out-of-school youth and adults. Such courses, conducted with the cooperation and active assistance of defense industries, are designed to equip trainees in from three to six weeks' time for single, specific operations. In one community, a vocational school is conducting on a three-shift basis an intensive program of adult retraining, adapted specifically to the employment requirements of one large company. The company has provided much of the equipment and materials used for training, as well as full-time skilled mechanics as instructors. Such training programs, when closely coordinated with the immediate needs of industry, can develop in a surprisingly short time a large number of potential machine operators and workers who are skilled in part of a craft job.

Other training programs for youth, such as the unit instruction courses in some CCC camps, are being expanded. There is also a growing interest in the development of short summer courses by engineering schools which may provide instruction in drafting, testing of materials, designing, personnel supervision, and clerical jobs involving a combination of engineering and commerce required in the offices of industry.

Experience Reported

> The part played by the vocational schools in speeding up the process of training semi-skilled workers is hard to overestimate, *provided* that the particular practical problems which the worker will encounter are stressed. To teach a "green" man how to start, operate and stop a machine tool in which the work revolves and the tool is stationary is a simple matter and can be taught in a few hours. The real problem is not in handling the controls of the machine, but is in understanding the form and use of tool shapes, cutting angles, cutting clearances, tool surface finishes, feeds and speeds. . . . If the student has been thoroughly grounded in related subjects such as blueprint reading, shop mathematics, and the properties of materials, and if his instructor knows what to teach and how to teach it, the training problem for work not requiring the highest grade of skill can be accelerated from years to months. The problem of finding qualified instructors for vocational schools is so difficult and yet so important that industry will probably find it necessary to supply these instructors from its supervisors and trained workers. . . .

> As an example of the service a vocational school can render in a period of rapidly expanding production such as the present, the following case may be cited. In approximately six weeks' time this plant will require twenty-four milling machine operators for straight production work. Skilled operators are no longer to be found. Twenty-four men who are mechanically inclined but who have not had the requisite education to be considered for apprenticeship, have been selected for this

work. At the request of the plant the vocational school is conducting a special class for these men. Half of the day is spent working on milling machines and the other half at drafting and blueprint reading. Some of these trainees were still at school and others were selected in the usual manner. It is anticipated that after this preliminary training they will quickly attain to the performance of regular operators.

The company cooperates closely with technical high schools and vocational schools. The management endeavors to help the schools to keep their training program up to date and in line with the company's demand for workers. In some cases the company supplies materials for the students to work with. Several of the skilled group leaders help with the instruction in the night schools which are being set up to provide short-period intensive training.

The personnel director of the company acts in an advisory capacity to the local board of vocational education. He is also associated with state and federal organizations in the vocational training field.

While educational institutions of the community have done all in their power to cooperate and be helpful, the extent of their helpfulness lies in training the boys in certain fundamentals such as blueprint reading, use of micrometers, scales, and the roughest principles of machine operations. The schools in this locality are handicapped by the fact that they have no standard *production equipment* for training purposes. However, the products of technical schools are considerably better for industry to work with than those of the general arts schools.

"The arguments in favor of teaching by the unit operation method are several. First, no matter how short a period the student studies he is taught a *definite* skill operation, such as making tennon joints on a chair part. Secondly, a student can start in the *middle* of the course, as well as at the beginning, providing he has some background. This is possible, because the units are arranged in an ascending order of difficulty, as nearly as possible, but in many cases an isolated skill that is quite advanced can be taught and the learner will be able to perform that skill without the previous study. . . .

"Another advantage to the unit operation method is that a student can progress at a rate commensurate with his ability to learn instead of waiting for a group to advance to the next lesson or job.

". . . Unit operation methods recognize only *standard times* for the accomplishment of definite jobs. Time devoted to instruction depends on the number of units to be taught and the ability of the student. The student knows that he is not spending a year in a class but that he has a definite number of skills or units to learn.

"In summary, it can be seen that the course will be organized so that the most able men will complete all the units of the course while the less able will complete only certain units and learn only as many skills as they can learn well *in any given period of time,* thus omitting those units for which they have no aptitude or interest and devoting all their time to mastering a selected few. Of course a learner may, by persistent effort and association, learn more units of his trade if he works in that trade and he may eventually advance to more skilled work."

—*Unit Instruction for Short Period Training,* by Delano G. Rice, District Educational Advisor, Headquarters First Corps Area. 1940. pp. 2-3.

The possible cooperation of the public vocational school and industry is well illustrated by the effective coordination already developed in one community:

> The ——— Vocational School has three separate training programs. (1) The regular day school offers preliminary training in auto mechanics, carpentry, chemistry, drafting, electricity, machine operation, plumbing and textile work. Courses of this type require two years, and aim to give the pupils sufficient training to enable them to enter industry as plant workers. The trainees start these courses at age 16. (2) The regular evening school offers supplementary training to employed industrial workers; and (3) the adult retraining program recently developed is the principal area of cooperation between the school and a rapidly expanding machine industry in the city.
>
> Adaptation of the vocational training to the community's industrial needs was planned from the beginning of the school. There are advisory committees made up of representatives of the city's major industrial units. One member of each of these committees serves on the Board of Trustees. The advisory committees recommend the most desirable training program for each type of work, and the Board discusses and approves. The Director is responsible for carrying out the program.
>
> The adult retraining program was inaugurated in the fall of 1939 at the suggestion of one of the largest employers in the community. The city was willing to finance the cost of an expanded adult training program because this company could assure employment to all the graduates. The company supplies much of the machinery necessary for the student training, and provides most of the material used by the trainees. The cost to the school is about $30 per student.
>
> *Selection of Trainees.* Many more applications for the adult retraining course are received by the school than are accepted. The average

age of trainees thus far has been between 20 and 25 years. There may be some attempt to draw more on an older group. To be accepted, an applicant must pass a physical examination and must obviously be qualified for mechanical work. The number of failures in each group has been about 15%. All who have completed the course have been employed immediately.

Instructors. The regular school staff has been supplemented by men from nearby industries employed by the school on a part-time basis and by skilled mechanics loaned by the company.

The Course of Study. The school training covers four weeks, one week to elementary mathematics, science, and blueprint or worksheet reading, the remaining three weeks to instruction in operation of various machines. The students are assigned to machine jobs of more or less difficulty depending on their mechanical aptitude. The assignment to specific machines is made on the basis of information on the application form, the first week's classroom record of the student, and the immediate demand in the company for workers in a particular type of operation. The significant point in the training is that each student learns to operate just one machine.

Number of Students. The average size of each class is approximately eighty students. New classes have been started every three weeks. The company could absorb many more students than are at present completing the course, and the school is putting the training on a two- or three-shift basis and increasing the number in each class. It will be possible to turn out at least 100 trainees each week.

Additional Training after Employment. Upon completion of the training course, the trainees are employed as learners. For about a month or six weeks, depending on the individual and the job, these learners are given instruction on a particular machine by a qualified operator and paid by the hour. After that period, they are assigned their own machine and paid in accordance with the group bonus compensation plan established throughout the plant. Because of the group bonus, older workers give full cooperation and assistance to the new employees to help them meet production standards as quickly as possible.

The success of this adult training program has been dependent upon a number of factors:

1. Students are trained for specific operations on which they are almost certain to be employed.
2. The close cooperation between one company and the school permits the company to supply the correct type of machines for training and also skilled mechanics for instruction.
3. The training program is flexible and is continually adapted to the specific employment needs of the company.

D. COORDINATION AND SUPERVISION OF TRAINING

A statement made in regard to the question of responsibility for training was that it "will be neglected unless it is carefully organized." Decentralized training is often most efficient and most flexible, but central coordination is essential in developing a program adequate to production requirements and in maintaining training schedules and standards.

Experience Reported

> Some of the things which we have learned from the past three years of expansion seem rather simple and obvious, but adherence to them has brought us success. We have learned that everyone in a supervisory position is so busy with production problems that training will be neglected unless it is carefully organized. Haphazard efforts accomplish little or nothing. Careful organization and avoiding the placing of too heavy a load on any one person or department are, we believe, the key to our success.

> Training is decentralized to permit quick response to changes in production. The director of apprentice and trainee programs is responsible to the General Superintendent; the training of graduate engineers is carried on by the Engineering Department. The Personnel Department cooperates in planning and procedures, but final responsibility is left with individual departments.

> "In large companies which have a separate training section there have been problems of responsibility and authority. When the training is done in a vestibule school the training staff is in charge and few difficulties arise. It is important, however, to coordinate the kind and quality of instruction given with production requirements. When training is conducted in the production departments—whether in a separate training section or not—the foreman is responsible for results. The training staff assists the foreman by organizing what is to be taught. Furthermore, under certain types of training for the more skilled jobs, the training staff has the responsibility for seeing that training schedules are followed and that learners are rotated from one job to another."
>
> —*Intensive Training of Industrial Employees,* Policyholders Service Bureau, Metropolitan Life Insurance Company. New York. pp. 13, 14.

V. WAGES AND HOURS OF WORK

A. CHANGES IN WAGE-RATE STRUCTURE

AN attempt is being made to avoid the distortion of wage rates prevalent at the time of the World War. Established job classification and improved rate-setting methods are factors which will help companies to foresee and forestall great variation in accepted differentials.

Experience Reported

A few years ago all jobs in the plant were carefully evaluated. Since that time rates have been set strictly on the basis of the job evaluation sheet. When any question concerning differential compensation arises, the management and the union discuss the case on the basis of the scoring under job evaluation. The system is very simple and easily understood by the union representatives.

It is important to note that during the period of expansion there has been no distortion in the wage rate structure. The company has not been forced to pay unusually high rates to get better men and does not intend to do so.

On the subject of wage rates we would say that piece work is the long established method of wage payment for productive work. In each of our plants the Methods and Rates Department would meet any call for increased activity with the aid of additional time study observers, many of whom would be selected from among properly qualified men working in the shop and experienced along certain lines. These men would be trained to make time studies according to the accepted method of observation. Complaints concerning piece work prices would continue to be investigated and adjusted by the Methods and Rates Department.

All employees are paid flat hourly rates for their occupation in accordance with the plan of job evaluation. In addition all employees participate in a "group bonus" plan.

"One example of how this problem of wage adjustments to rising living costs is being solved is furnished by the agreement between the

> United Mine Workers and bituminous coal operators in Western Canada, recently concluded. Instead of granting employees a percentage rise in wages to offset the higher living costs, this agreement provides for a cash bonus of uniform amount to be paid to all workers, irrespective of their regular weekly wages, to offset higher prices for the necessities of life. The amount of this cash bonus is to equal the computed increase in the actual cost of living in each locality, to be determined separately.
>
> "A subsequent decline in the cost of living is to bring a corresponding reduction in this cash bonus. A commission has been set up to measure living costs every four months.
>
> "An interesting proviso in this agreement specifies that no allowance is to be made for increases in living costs due to the imposition of higher taxes on consumption. This takes account of the fact that some decline in consumption is desirable during a war period, since productive facilities must be diverted from civilian use to the manufacture of war materials."
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> —*Journal of Commerce,* June 4, 1940. p. 2.

B. ORGANIZATION OF TWO AND THREE-SHIFT OPERATIONS

Employee habits and attitudes, as well as the number of available supervisors and skilled workmen, experience indicates, must be considered in determining shift schedules. A rotation of shifts is customary in continuous-operation companies, but is not practiced where employees have formerly been used to one shift only. New employees may be assigned to a second or third-shift more easily than old employees can be transferred. It is found necessary, however, to have enough experienced workers on the extra shifts to instruct and assist the new workers. In some plants there is insufficient skilled personnel to operate three full shifts. In such cases, two shifts of ten or twelve hours may be required.

Experience Reported

> The night shifts were built up and stabilized by requesting the older and most resourceful and more skilled employees to work nights at an extra premium. They were thus available to assist the newer workers. . . . All of the new men employed, including learners, were informed that they would have to work nights.
>
> In order to get maximum production we originally scheduled our shifts for eight hours, informing the men to eat their lunch "on the fly." We found, however, that no more work was being produced than formerly was done at 7½ hours. Therefore we changed and allowed a scheduled half-hour lunch period on each shift. Irritations which under normal circumstances would be ignored, developed due to the

fact that the men were working seven days a week. Rotation of the working force was not considered desirable by the men. They claimed that this upset their habits.

Providing ample parking space was seemingly a simple problem but caused a great deal of annoyance.

The problems of additional shifts and supervision are so interrelated that they are here dealt with together. Three main factors have determined the measures taken by the Company; the organization of the supervisory function, the availability of thoroughly competent supervisors, and the amount of supervision which any given work requires.

In departments where supervision requirements are not great, a few good workmen have been selected as leaders for the night shift. These leaders work under the supervision of the Night Superintendent. In other departments where greater supervision is required, it has been necessary to place the regular contact supervisors on the night shift in order that during the day contact may be maintained with the newly appointed supervisors. In such a case new operators would be placed on the night shift where the regular foreman, relieved of many matters requiring his attention during day time operations, is able to devote the major part of his time to assisting new employees to become familiar with the requirements of our work.

When one supervisor is responsible for a department, the best solution has been to have a man in reserve capable of competent supervision, who can be assigned to night supervision. In such a case new operators are placed on the night shift.

Various plants and various departments in the same plant are working different schedules. Three shifts are preferred when twenty-four hours per day must be worked; these are timed from 8 a.m. to 4 p.m., 4 p.m. to 12 midnight, and 12 midnight to 8 a.m.

A number of departments are working 7 a.m. to 5 p.m., and 5 p.m. to 1:30 a.m., and in some cases 2:30 a.m. Some hundred men are operating on such a night shift.

In a second plant situated in a metropolitan area, two shifts are operating in a number of departments: these operate from 7 a.m. to 5 p.m. and from 7 p.m. to 6 a.m. On this latter shift one hour is allowed for lunch just as on all day shifts throughout the Company. Among considerations leading to the establishment of the 7 p.m. to 6 a.m. schedule, were the following: Family arrangements for the evening meal would not be complicated, rush periods for city transportation would be avoided, and in certain departments the day supervisor can return after supper to see that work is satisfactorily commenced.

Wherever possible, shifts are rotated weekly.

> Two- and three-shift operation has been put in effect from time to time in our larger plants, whenever a sudden rush of business has demanded such action. At such times, the nucleus of the second and third shift supervisory organization was built up from among experienced men in the day shift. We intend to follow the same procedure if additional shift work becomes necessary.

> At the present time the plant is working over 200 per cent of normal. Because of the shortage of skilled help, it is necessary to have two rather than three shifts. The day shift works 10 hours for five days a week; the night shift, 12½ hours. Saturday work is suspended during the summer months.
>
> There is no rotation of shifts.

> There has been some difficulty in convincing our supervisors of the need for a night shift. The older workmen do not willingly change to a night shift.

> Many of our plants are working on a two-shift basis and we want to avoid a third shift if possible. A third shift is expensive, and it is more convenient for machine maintenance men to work during the night than on Sunday.

C. WAGE DIFFERENTIAL FOR NIGHT WORK, AND OVERTIME RATES

Most companies which have normally worked on one-shift schedules pay a bonus for the additional second and third shifts, ranging from five to ten per cent, to overcome the objection to night work. In order to induce older workers to accept night work one company was considering paying a basic differential of five per cent to men of three years' service plus one-half per cent for each additional six months' service. In continuous process industries where shifts are commonly rotated, differential pay for night work is not so common.

Overtime beyond eight hours per day and forty hours per week is commonly paid at the rate of time-and-a-half. Such a practice, of course, is very costly, but is necessitated by shortages of available skilled personnel.

Experience Reported

> Differential compensation for night shift work has long been a Company policy and has been incorporated in the union contracts. [The agreements specify that "hourly-paid and piece-work employees operating on the second and third shifts are to receive ten per cent over

and above the prevailing rate in their respective classifications for the hours up to and including eight in either shift. . . ."]

To overcome the dislike of older men for the night shift, the company is considering a differential of 5% for men with more than three years' service plus ½% additional bonus for each additional six months' service.

The company operates on a three-shift basis. All workers on two night shifts are paid a 10% additional differential. The shifts are not rotated.

Time and one-half is paid for work in excess of 40 hours per week. There is a flat differential of 5 cents per hour for all work on the night shift.

The company operates on a three shift basis. On the second shift a six cents per hour differential is paid. On the third, it is nine cents.

We pay 7% for all work on the second and third shifts.

Our plants work normally only day turns. Night work, that is work performed between 9 p.m. and 9 a.m. is rather unusual except in a minority of continuous operations. For this reason wherever night work is required, a differential of 8% to 10% is customary. This differential has been an established company policy for many years, and has been more recently a subject of collective bargaining with labor organizations.

Difficulty was encountered in inducing the older men to work nights even at 5% greater earnings.

Because of lack of skilled set-up men, tool and die workers, etc., the plant now runs on a two shift basis of 10 hours each. Time-and-a-half is paid for all work over eight hours per day. A 5% differential is allowed for the night shift.

The standard production schedule is five days. Overtime is paid at time-and-one-half for all work in excess of 40 hours per week. Overtime is also paid to any man who is called upon to work on any shift which is not his regular shift. All Saturday and Sunday production work is paid for at overtime rates.

Management prefers to avoid employment of the working forces over 40 hours per week. It has been found that overtime is extremely costly after the first hour.

VI. EMPLOYEE-MANAGEMENT COOPERATION IN ACCELERATED PRODUCTION

THE employment of new workers who are unfamiliar with company policies emphasizes the need of some sort of machinery for settlement of grievances and adjudication of disputes. Some companies have no established grievance procedures. Others have oral or written working agreements with national unions or unaffiliated employee organizations. A few companies have made a determined effort to secure union cooperation by discussing programs of expansion, methods of job evaluation, wage rates, and other matters, with union representatives prior to taking action.

Experience Reported

Plant employees are organized in an independent union. Relations with this union have been very cooperative and harmonious.

There are no rigid seniority rules. In fact, the company defines seniority largely in terms of merit rather than length of service. The union recognizes this position, but is not completely sold on it. At the present time the company is working on an employee ability rating system as a means of determining differential compensation on the basis of merit, and as a means of determining qualification for promotions.

Prior to embarking on this program we advised the independent union with which we deal of what we were contemplating. We verbally described some of the problems that would be encountered, such as standards being set improperly, lack of lockers, parking space, etc., and then asked them if they wanted us to tackle the proposition. Of course, they answered yes. Therefore, the union has been quite reasonable and patient with respect to matters which legitimately require adjustment. Standards were hastily set; changes in methods were introduced from day to day, requiring retiming; individual wage adjustments were not made promptly enough due to other matters being on the foremen's mind; new foremen and supervisors were not as considerate as they should have been in dealing with these problems. However, the foundation originally laid helped us over this hump. Rates on the new jobs were set by comparison with other jobs inside the company and by information we had on rates paid in other companies for comparable types of work. Rates in all cases were jointly set with the union.

Grievances were handled consistently with a procedure which had been established in our company for seven years. Either the employee or his representative presented the matter to the foreman of the department. If satisfaction could not be obtained from the foreman, it was then referred to the Personnel Division which checked with the proper operating officials. If proper settlement could not be effected in this manner, the matter was then entered for discussion in a regular joint meeting between the union committee and a committee of management officials.

The company has recognized a national union as the collective bargaining agency for those employees who are members of the union. The statement of labor policy is discussed with the local union, and is in effect a working agreement. It provides for adjustment of grievances, reasonable regard for seniority, appeal in case of dissatisfaction in timing of new jobs, and for overtime pay at the rate of time and a half for all hours worked in excess of eight in any one day or forty in any one week.

The company has a contract with an independent union which has exclusive bargaining rights, in accordance with an election held by the N.L.R.B. Relations have been amicable. The company consults the union on all proposed changes in production. The union has accepted the job evaluation and employee rating plans.

The grievance procedure is rather unusual. If the employee fails to settle his case directly with the foreman, he takes it to the union steward. The steward then takes a written case to the President and Secretary of the union. The Secretary and President of the union settle cases then directly with the personnel manager. They may present cases at any time of the day or night and do not have to make an appointment in advance. Failing settlement at this stage a joint meeting may be held. The management committee is composed of the vice president of operations, the factory manager, and the personnel director. The union is represented by its officers and stewards. In general, cases have been settled satisfactorily.

It is estimated that more than 80% of the workers belong to the union. Although relations have been amicable, there is always the possibility of trouble in situations where so many new workers are being employed. Management is somewhat concerned over the possible lack of control by the union officers over the newly employed workers.

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